Social Support Is a Primary Influence on Home Fruit, 100% Juice, and Vegetable Availability

Tom Baranowski, PhD, **Kathy Watson, MS, MPH**, **Mariam Missaghian, MS**, **Alison Broadfoot, MS**, **Karen Cullen, DrPH, RD**, **Theresa Nicklas, DrPH**, **Jennifer Fisher, PhD**, **Janice Baranowski, MPH, RD**, and **Sharon O'Donnell, PhD**

T. Baranowski is a professor of pediatrics, and K. Watson is a biostatistician, US Department of Agriculture, Agricultural Research Service Children's Nutrition Research Center, Department of Pediatrics, Baylor College of Medicine, Houston, TX. M. Missaghian is a research associate, University of Puerto Rico; at the time of the study, she was a project coordinator, Department of Pediatrics, Baylor College of Medicine, Houston, TX. A. Broadfoot is a graduate assistant, Department of Psychology, Bowling Green State University, Bowling Green, OH. K. Cullen is an associate professor, T. Nicklas is a professor, J. Fisher and J. Baranowski are assistant professors, and S. O'Donnell is an instructor, Department of Pediatrics, Baylor College of Medicine, Houston, TX.

Abstract

Children tend to eat more fruit and vegetables when more are available in the home. We proposed and tested a model that predicts the availability at home (hereinafter termed "home availability") of fruit, 100% juice, and vegetables, using new measures of frequency of food shopping, purchase, and comparative purchase outcome expectancies (ie, the perceived benefits and costs of purchasing fruit and vegetables), home food pantry management practices, family social support for purchasing fruit and vegetables, food shopping practices, and body mass index (BMI). Participants (N=98) were recruited in 2004 in front of grocery stores and completed two telephone interviews. Cross-sectional hierarchical regression was employed with backward deletion of nonsignificant variables. Despite many statistically significant bivariate correlations between the new variables and home fruit, 100% juice, and vegetable availability, social support was the primary predictor of home fruit availability in multivariate regression. BMI and home 100% juice pantry management were the primary predictors of home 100% juice availability. Social support, BMI, and shopping practices were the primary predictors of home vegetable availability. Social support for purchasing fruit, 100% juice, and vegetables was an important, consistent predictor of home availability. These findings need to be replicated in larger samples.

Consuming fruit, 100% juice, and vegetables has many positive health outcomes (1). Children tend to eat more fruit, 100% juice, and vegetables when they are available in the home (2). Little is known, however, about factors influencing home availability of these foods. Enabling adult food shoppers (with children at home) to purchase more fruit, 100% juice, and vegetables should increase home availability, and thereby children's consumption. Qualitative research suggested a variety of factors may influence the purchase of fruit, 100% juice, and vegetables and thereby increase their availability in the home, including: frequency of food shopping (3); purchase and comparative purchase (eg, such as fresh vs other); fruit, 100% juice, and vegetable outcome expectancies (ie, the perceived benefits and costs of purchasing fruit, 100%

juice, and vegetables) (4); home food pantry management practices (5); family social support for purchasing (6); and food shopping practices (7). The Figure provides a conceptual model of how these variables could logically be interrelated.

Based on participant statements in qualitative interviews about home food practices, items were generated for corresponding scales. In subsequent quantitative research, the psychometric characteristics were assessed and validated against measures of home fruit, 100% juice, and vegetable availability (4–7). A relatively new psychometric procedure, Item Response Modeling, assessed how the items distributed across a latent variable and thereby covered the distribution of all participants. All scales correlated with home fruit, 100% juice, and vegetable availability, even after correcting for social desirability response bias. The authors hypothesized that all the new scales would predict home availability of fruit, 100% juice, and vegetables.

METHODS

Design

This was a cross-sectional study. Food shoppers were recruited in front of supermarkets and grocery stores to participate in two interviews, separated by 6 weeks. The data reported here were from the second interview alone. The interviews began March 25, 2004, and were completed June 25, 2004. The Institutional Review Board of the Baylor College of Medicine approved the research protocol. All participants provided signed informed consent during initial contact in the store.

Sample Recruitment

First, stores were recruited, then shoppers within stores were recruited (4–6). Twenty-two stores (20 large, two small) were selected to be approximately evenly distributed throughout all neighborhoods of the city. The inclusionary criteria for individuals were being aged 19 years or older, having at least one child aged 18 years or younger in the home, being the family's primary food purchaser, and not being away from home in the next 2 to 3 months. Recruitment and interviews were conducted in English and Spanish, as necessary. Of the 248 people recruited in front of the stores, 167 (67.3%) completed the first interview by telephone and 98 (58.7%) completed the second interview (Time 2) by telephone. Participants received $20 for completing the first interview, and an additional $25 for completing the second interview.

Measures

Demographic characteristics were measured using common questions. Self-reported height and weight were collected at the second telephone call. Body mass index (BMI) was calculated.

The home fruit availability scale had 13 items; 100% juice availability had three items; and the vegetable availability scale had 18 items. The respondent was asked if each item was available in the home in the past week (yes/no) (5). These scales were previously validated against home observation (8).

Frequency of food shopping was measured using a previously validated item (3).

Outcome Expectancies for Purchasing Fruit, 100% Juice and Vegetable scales included nine items each. Example items at the extremes of the item distribution included: "I like to eat fruit (vegetables) because they are good for your health; … they are inexpensive". A five-category response scale (strongly disagree to strongly agree) was used (4). Comparative Outcome Expectancies for Purchasing Fresh vs Other Forms of Fruit, 100% Juice, and Vegetable scales included nine items each. Example items at the extremes of the item distribution included:

"Comparing fresh with canned, bottled, and frozen fruit (vegetable), would you say fresh are better for your health; … fresh are quicker to prepare?" A six-category response scale (canned always, canned most of the time, not sure, fresh and canned about equal, fresh most of the time, fresh always) was used for data collection (4).

Home Fruit, 100% Juice, and Vegetable Pantry Management Practices scales included eight items each. Example items at the extremes of the item distribution included: "I decided to buy more canned, bottled, or frozen fruit (vegetable, 100% juice) when they are on sale; … to keep a variety at home (5)." A five-category response scale (strongly disagree, disagree, not sure, agree, strongly agree) was used (5).

The food shopping practices scale had 12 items. Example items at the extremes of the scale included: "How often do you look in the refrigerator/pantry before you go shopping to see what you need? … read labels for nutrients?" A five-point response scale was used for each item (0=never, l=rarely, 2=sometimes, 3=most of the time, and 4=all of the time) (6).

The Purchase Social Support scales had five items each. Example items at the extremes of the scale included: "How often has someone approved when you purchased fruit or 100% juice (vegetables)? … discussed purchasing fruit and 100% juice (vegetables) with you?" A five-category response scale was used for each item (from 1=never to 5=very often) (6).

Social desirability of response was measured using the "Lie Scale" from the Revised Children's Manifest Anxiety Scale (9). This subscale consists of eight items each coded yes/no, and had a Cronbach's α of .76 (10).

Statistical Methods

Time 2 data were employed for these analyses. Variable estimates on the new scales were made using Item Response Theory procedures (11). Tests of independence (χ^2) and *t* tests for independent samples were used to assess differences in demographic characteristics and scale scores between cases with vs without complete data. Pearson correlations were calculated for all variables related to fruit, 100% juice, and vegetables, separately. Using Statistical Analysis Systems (version 9.0, 2005, SAS Institute Inc, Cary, NC), block linear regression analyses were performed with home availability of fruit, 100% juice, and vegetables as dependent variables. Model 1 examined the regression of availability on the demographic characteristics (ie, age, sex, race/ethnicity, highest level of education in the household) and frequency of shopping. Social desirability and BMI group were added as independent variables in Model 2. The remaining independent variables (ie, purchase and comparative purchase outcome expectancies, home pantry management, family social support for purchasing, shopping practices, and food store selection expectancies) were added with backward elimination in Model 3.

RESULTS AND DISCUSSION

Among the 126 people with Time 2 data, 28 had incomplete data and were not included in the analyses. More complete data were available on African Americans and participants with complete data tended to have lower fruit and vegetable purchase outcome expectancies. There were no other differences on demographics or the new variables. In general the sample was aged 38.8 years with 2.4 children living at home, mostly women (76.2%), ethnic minority (82.6%), high school graduates or less education (51.5%), and overweight (61.1%).

Home Fruit Availability

Four of the new variables were bivariately related with home fruit availability. Respondents with higher BMIs did not have more fruit available at home. Only highest attained household

education was significantly inversely related to home fruit availability in the first step model (see the Table). Neither social desirability nor BMI were significantly related to home fruit availability after controlling for demographics in the second step model. Only social support was a predictor in the third step model and accounted for 16% of the variance in home fruit availability (Table).

Home 100% Juice Availability

Home 100% juice availability was significantly bivariately related with many of the variables, including BMI. Only highest attained household education was significantly negatively predictive of 100% juice availability in the first step model (Table). BMI group was significantly related in the second step of the model testing process. BMI and home 100% juice pantry management practices were significantly related in the third step and the model accounted for 18% of the variability.

Home Vegetable Availability

Home vegetable availability was significantly bivariately related to most of the other variables. None of the demographic variables were related to home vegetable availability in the first step of the model (Table). BMI was predictive of home vegetable availability after controlling for the demographic variables (Table), and BMI, social support, and shopping practices were substantially predictive of home vegetable availability, accounting for 17% of the variability in Model 3 (Table).

Although most of these variables were bivariately correlated with a corresponding indicator of home fruit, 100% juice, and vegetable availability, social support for purchasing was the primary consistent predictor for home fruit and vegetable availability, even after controlling for demographic factors, social desirability of response, and BMI. Social support has been a predictor of other health-related behaviors (12) and thus offers promise of better understanding home fruit, 100% juice, and vegetable availability. The importance of the new variables was emphasized by the substantial increase in predictiveness of the multivariate models when the new variables were added.

The patterns of relationships were consistent with the proposed conceptual model of interrelationships (Figure). The small sample likely precluded verifying all the proposed relationships. Further research with larger samples will be necessary to test the proposed relationships.

Limitations

A limitation of our research is the small sample size due to the measure creation and validation purposes of the sample. It is possible that more variables would be predictive if sufficient statistical power were available to detect those relationships. It is also possible that interactions existed among some of the variables in predicting home fruit, 100% juice, and vegetable availability; however, no interaction terms were tested due to the low statistical power. Other limitations include possible differences in participating vs nonparticipating stores, not being generalizeable beyond the city of Houston, TX, and the focus on total home fruit, 100% juice, and vegetable availability, not by fresh, frozen, or canned separately.

CONCLUSIONS

Home fruit, 100% juice, and vegetable availability has been related to fruit, 100% juice, and vegetable consumption among children (2). Identifying substantial correlates of home fruit, 100% juice, and vegetable availability offers the promise of identifying levers by which to increase their availability, with the downstream effects of increasing children's consumption,

and reducing obesity and cancer risk. More research is warranted with these new measures of influence in larger samples. Ensuing research may target these variables for change.

Acknowledgments

References

1. Potter, JD., editor. Food, Nutrition and the Prevention of Cancer: A Global Perspective. Washington, DC: World Cancer Research Fund and American Institute for Cancer Research; 1997.

2. Jago R, Baranowski T, Baranowski JC. Fruit and vegetable availability: A micro environmental mediating variable? Public Health Nutr 2007;10:681–689. [PubMed: 17381953]

3. Yoo S, Baranowski T, Missaghian M, Baranowski J, Cullen KW, Fisher JO, Watson K, Zakeri I, Nicklas T. Food-purchasing patterns by parents for home: a grocery store intercept survey. Public Health Nutr 2006;9:384–393. [PubMed: 16684391]

4. Baranowski T, Watson K, Missaghian M, Cullen K, Nicklas T, Fisher J, O'Donnell S. Parent outcome expectancies for purchasing fruit and vegetables: A validation. Public Health Nutr 2007;10:280–291. [PubMed: 17288626]

5. Baranowski T, Missaghian M, Watson K, Broadfoot A, Cullen KW, Nicklas T, Fisher JO, O'Donnell S. Home fruit, juice, and vegetable pantry management and availability scales: A validation. Appetite 2008;50:266–277. [PubMed: 17959271]

6. Baranowski T, Missaghian M, Broadfoot A, Watson K, Cullen K, Nicklas T, Fisher J, Baranowski J, O'Donnell S. Fruit and vegetable shopping practices and social support scales: A validation. J Nutr Educ Behav 2006;38:340–351. [PubMed: 17142190]

7. Baranowski T, Watson K, Missaghian M, Broadfoot A, Cullen K, Nicklas T, Fisher J, Baranowski J, O'Donnell S. Food store selection expectancies scale: A validation. Obes Res. In press

8. Marsh T, Cullen KW, Baranowski T. Validation of a fruit, juice, and vegetable availability questionnaire. J Nutr Educ Behav 2003;35:93–96. [PubMed: 12725715]

9. Reynolds CR, Paget KO. National normative and reliability data for the Revised Children's Manifest Anxiety Scale. School Psychol Rev 1983;12:324–336.

10. Klesges LM, Baranowski T, Beech BM, Cullen KW, Murray DM, Rochon J, Pratt C. Social desirability bias in self-reported dietary, physical activity and weight concerns measures in 8–10 year old African-American girls: Results from the Girls health Enrichment Multi-site Studies (GEMS). Prev Med 2004;38:78–87. [PubMed: 14672644]

11. Hambleton, RK.; Swaminathan, H.; Rogers, HJ. Fundamentals of Item Response Theory. Newbury Park, CA: Sage; 1991.

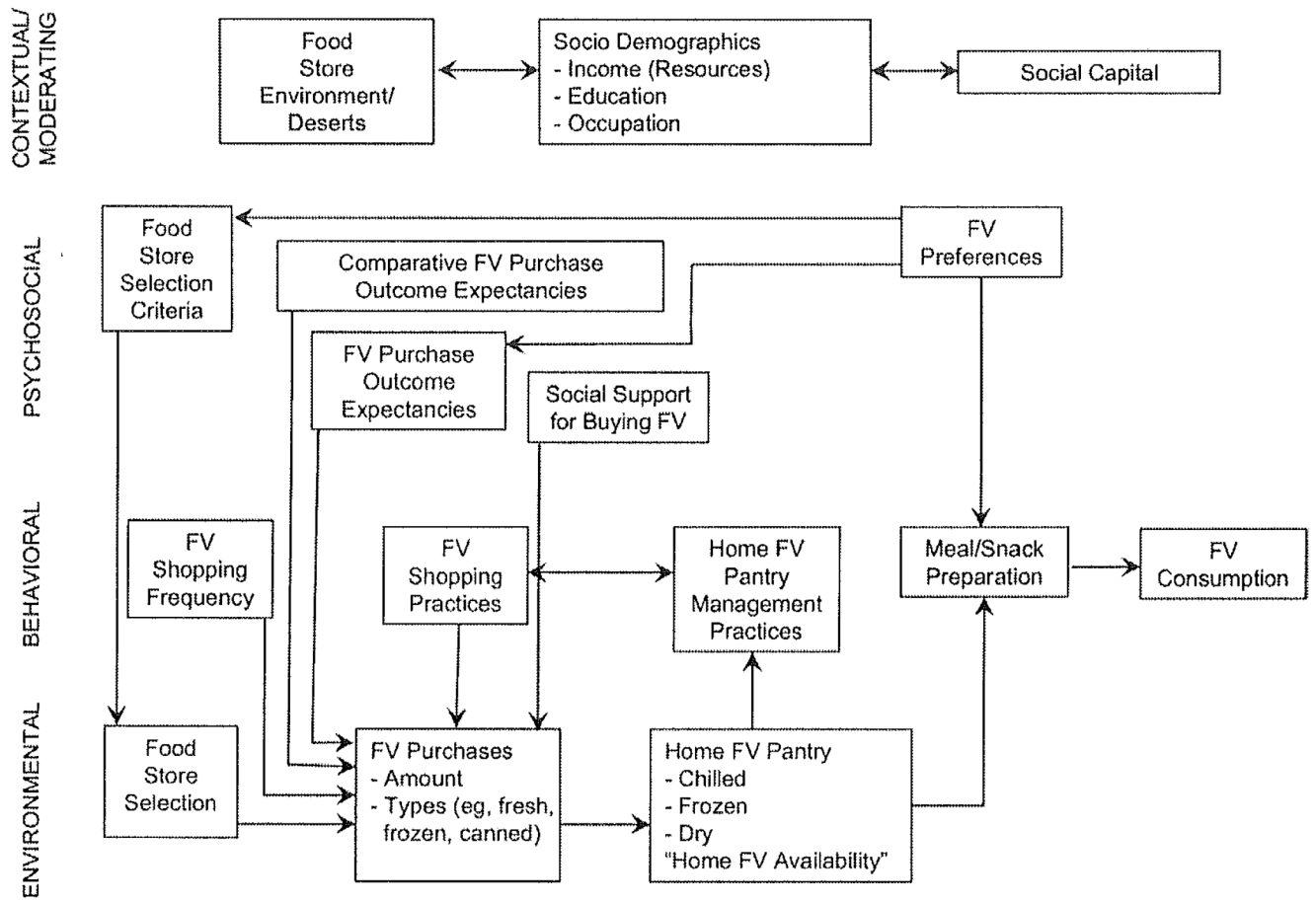12. Veiel, H.; Baumann, UE. The Meaning and Measurement of Social Support. London, UK: Hemishpere Publishing Co; 1992.

Figure 1.
Model of influences on home fruit and vegetable (FV) availability and consumption.

Table 1

Results from Block regression analyses of the availability of fruit, 100% juice, and vegetables in the home on purchasing and comparative purchasing outcome expectancy for fruit, juice, and vegetables; pantry management of fruit, juice, and vegetables in the home; social support for purchasing fruit, juice, and vegetables; and shopping practices, after controlling for demographic characteristics, social desirability, and body mass index at the Time 2 Interview (n=96)

Variable	Model 1 B±SE[a]	Model 1 β	Model 2 B±SE	Model 2 β	Model 3 B±SE	Model 3 β
Fruit						
Age	0.00±0.01	.03	0.00±0.01	.03	0.01±0.01	.09
Sex (reference group: male)	−0.08±0.20	−.05	−0.06±0.20	−.03	0.07±0.19	.04
Household education (reference group: <high school grad/general equivalency diploma)						
Some college, vocational/technical school	−0.32±0.19***	−.19	−0.30±0.19	−.18	−0.28±0.18	−.17
College graduate	0.27±0.24	.14	0.26±0.25	.13	0.12±0.23	.06
No. of shopping trips (reference group: 1–2 big+no/few small)						
3–4 Big+no/few small	0.12±0.19	.07	0.13±0.19	.08	0.16±0.18	.11
Other	−0.14±0.23	−.07	−0.15±0.23	−.07	−0.11±0.21	−.06
Race/ethnicity (reference group: white)						
Hispanic	0.37±0.32	.24	0.29±0.33	.19	0.18±0.30	.12
Black	0.12±0.29	.08	0.05±0.30	.03	−0.13±0.28	−.09
Social desirability			0.02±0.06	.04	0.03±0.06	.04
Body mass index group (reference group: overweight/obese)			0.16±0.17	.10	0.15±0.16	.09
Social support					0.42±0.11*	.39
Adjusted R^2	0.03		0.02		0.16	
100% Juice						
Age	0.00±0.01	.02	0.01±0.01	.04	0.01±0.01	.07
Sex (reference group: male)	−0.05±0.28	−.02	0.06±0.27	.02	0.13±0.26	.05
Household education (reference group: <high school grad/general equivalency diploma)						
Some college, vocational/technical school	−0.51±0.26***	−.22	−0.46±0.25***	−.20	−0.51±0.25**	−.22
College grad	0.51±0.34	.19	0.43±0.33	.16	0.34±0.32	.12

Variable	Model 1		Model 2		Model 3	
	B±SE[a]	β	B±SE	β	B±SE	β
No. of shopping trips (reference group: 1–2 big+no/few small)						
3–4 Big+no/few small	−0.27±0.26	−.12	−0.21±0.26	−.09	−0.19±0.25	−.09
Other	−0.2±0.32	−.08	−0.25±0.30	−.09	−0.24±0.30	−.09
Race/ethnicity (reference group: white)						
Hispanic	0.25±0.44	.12	−0.05±0.43	−.02	−0.18±0.42	−.08
Black	0.54±0.40	.25	0.23±0.40	.11	0.00±0.40	.00
Social desirability			0.12±0.08	.14	0.10±0.08	.12
Body mass index group (reference group: overweight/obese)			0.60±0.23*	.26	0.58±0.22*	.25
Juice pantry management					0.16±0.07**	.24
Adjusted R^2	0.07		0.14		0.18	
Vegetable						
Age	0±0.01	.06	0.01±0.01	.07	0.01±0.01	.08
Sex (reference group: male)	−0.05±0.19	−.03	0.03±0.19	.02	0.27±0.18	.16
Household education (reference group: <high school grad/general equivalency diploma)						
Some college, vocational/technical school	−0.21±0.18	−.13	−0.18±0.18	−.12	−0.13±0.16	−.08
College grad	−0.12±0.24	−.07	−0.18±0.23	−.10	−0.15±0.21	−.08
No. of shopping trips (reference group: 1–2 big+no/few small)						
3–4 Big+no/few small	0.08±0.18	.06	0.14±0.18	.10	0.16±0.17	.11
Other	0±0.22	.00	−0.01±0.21	−.01	−0.04±0.2	−.02
Race/ethnicity (reference group: white)						
Hispanic	0.09±0.3	.07	−0.1±0.3	−.07	−0.08±0.28	−.06
Black	0.21±0.28	.15	0.02±0.28	.01	0.04±0.26	.03
Social desirability			0.08±0.06	.15	0.08±0.05	.14
Body mass index group (reference group: overweight/obese)			0.35±0.16**	.24	0.37±0.15**	0.25
Social support					0.35±0.12*	.31
Adjusted R^2	−0.06		0.01		0.17	

Variable	Model 1		Model 2		Model 3	
	B±SE[a]	β	B±SE	β	B±SE	β

[a]B±SE=regression coefficient±standard error.

*
P<0.05.

**
P<0.01.

***
P<0.001.